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ABSTRACT

Fishing vessel accidents occur because of complex interactions of human, technical, and environmental factors. Although they usually occur because of human actions, thoughts, or behavior, investigators and prevention educators are preoccupied with technical matters and equipment. Equipment, machinery, weather, and other objective facts are important, but these perspectives must be broadened. Accident investigators and prevention educators should ground their strategies in interpretivist, radical humanist, radical structuralist, and functionalist approaches. These different perspectives were used to analyze what happened during the loss of the Scotia Cape, a Canadian fishing vessel that sank. The Transportation Safety Board investigation has determined it probably rolled over and sank because of "free surface effect," which is important as a result, not a cause, of the accident. The cause resides in the unequal power relations between the company and crew and between the skipper and crew, in their "false consciousness," and in their subjectively derived notions of safety and risk. Prevention programs informed by interpretivist, radical humanist, radical structuralist, and functionalist perspectives would involve use of techniques that elicit and make use of the learner's background and experience. Because the fishing fleet is highly differentiated, content would be adapted to local circumstances. Prevention education processes would be participatory--involve fewer lectures and more active collaboration with learners. (60 references) (YLB)

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THEORETICAL PERSPECTIVES ON FISHING VESSEL ACCIDENTS AND THEIR PREVENTION[1]

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Problem

On July 21, 1993, in the early hours of the morning, the tug *Arctic Taglu* was pushing a barge south in Georgia Strait, B.C. Unbeknown to the master of the tug, the fishing vessel *Bona Vista* was immediately ahead. There was a collision, the fishing vessel rolled under the bow of the barge and six people were trapped in a putrid mixture of diesel and seawater. Although authorities attempted a rescue, and various divers were commended for their Herculean efforts, six people died in the most horrific circumstances.

When fishermen die, they usually do so in isolated places. But, in the case of *Bona Vista*, six people died within sight of Vancouver. There's was a public ordeal and fishing vessel accidents were, at least temporarily, a focus of attention.

Had the master of *Bona Vista* attended a course on the collision regulations at a marine training facility it is almost certain he would have sat passively in a classroom while a lecturer read from notes. Seeing that the students were restless, the lecturer would occasionally tell a story about a collision or near-miss based on their earlier (usually long ago) experience at sea. If the *Bona Vista* skipper was lucky the lecturer might use models to illustrate the rules of the road and the use of different lights, shapes and sound signals. Throughout the course the lecturer would emphasize the fact that what matters is the exam. At the end of the course a Coastguard employee would deliver a pile of multiple-

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☐Paper Presented to the 1996 SARSCENE conference (National Search and Rescue Secretariat), Dartmouth, Nova Scotia, October, 1996. The author is Professor of Adult Education at UBC and CEO of Gulflow Salvage and Marine Safety Ltd. During the 1996 summer fishing season he salvaged the Ranger (70' wood seiner sunk in Boundary Bay), the Athena VII (fibreglass Farrell gillnetter aground on a rock jetty) and the Shiana Bev (fibreglass over wood gillnetter aground in Ballenas Islands). In May, 1996 he was a New Democratic Party candidate in the British Columbia Provincial election.

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choice tests. The master of the *Bona Vista* would answer the easiest questions first, hazard a guess on the others but ultimately go home frustrated because (i) multiple-choice tests have little to do with the realities of piloting a vessel at sea (ii) the items in the test are poorly constructed, and (iii) the Coastguard examiner will not tell him his final score. Most likely, the master would not have attended this or any other adult education course.

According to the Transportation Safety Board (1996) the *Bona Vista* was displaying "non-standard" navigation lights on the night of the collision. It is probable that the master, like most other fishers, had not endured the course on the collision regulations, lights and shapes and, like adult learners everywhere, had profound doubts about the utility of multiple-choice tests. Sadly, the operator had taken five guests, all relatives, on a cruise to the west coast of Vancouver Island.

The *Bona Vista* was important because, in recent years public discussion concerning commercial fishing has largely been dominated by environmental matters such as the failure of the cod fishery in Newfoundland, the demise of parts of the salmon fishery in Washington, the "disappearance" of Fraser River salmon, the crisis involving ling cod, and the struggle over the Aboriginal Fishing Initiative.

These new environmental crises are significant but tend to obscure the dangers of commercial fishing in Canada, the trauma of extreme weather experienced on each coast and the fatalism of fisher families who absorb death and injury as an inevitable corollary of "harvesting" the sea .

Commercial fishing is a dangerous occupation - one of the worst - and fishers routinely fall overboard, get wound onto net drums, are hit by falling blocks or flaying beachlines and lose hands, arms, and other body parts in winches. From 1976 to 1993 almost 17,000 Canadians were fatally injured in the course of or as a result of their employment. Although fatality rates have been dropping, they remain high in the primary industries. Between 1988 and 1993 113 out of every 100,000 workers in fishing/trapping lost their lives, as

compared to 82 per 100,000 in logging and forestry and 63 per 100,000 in mining, quarrying and oil wells. B.C., which has many people likely to be employed in high-risk industries, had the highest death-rate at 15 per 100,00 paid workers (Statistics Canada, 1996).

There were approximately 37,000 commercial fishboats in Canada under Federal jurisdiction in 1992 (TSB Statistical Summary, 1993). Of the 907 marine accidents reported to the Transportation Safety Board in 1992, just over half involved fishing vessels (TSB Statistical Summary, 1993, p. 4). Analysis of Search and Rescue (SAR) statistics involving fishboats in Canada "strongly implicate" human error as the primary cause of incidents and accidents (Canadian Coastguard, 1987; Committee on Fishing Vessel Safety, 1991).

Loss of life in the Canadian fishing industry is primarily attributed to person overboard situations, capsizing, sinking, groundings, fires and explosions. High-value activities, such as the westcoast herring fishery, have had a disproportionate share of fatalities. The Canadian Coastguard (1987) maintained that the principal factors leading to human error were "risk-taking for profit induced by increased economic pressures, vessel design and safety sacrificed for economic benefit, poor seamanship." Of the 466 vessels involved in Canadian shipping accidents in 1992, in 221 cases (i.e. nearly half) the Transportation Safety Board (1993) considered the "primary contributing factor" to be human error.

Costs

In 1992 the Government of Canada spent about $135 million on a nonbinding referendum (on the Charlottetown Accord). But in the same year, and in most years previously and since, the Government of Canada spent nearly twice this amount - approximately $228 million - on (air, land and marine) search and rescue (SAR). Of the three (air, land, marine) marine incidents represent a considerable drain on public and private funds. For example, the 1990-91 federal estimates for marine SAR in Canada were as follows: National Defence $120 million; Transport Canada (Coastguard) $83 million; Fisheries and Oceans $889,000; RCMP $347,000. For every one hundred dollars that the Government of Can-

ada spent on SAR response it spent only $1.50 on SAR prevention (National Search and Rescue - Part III of the Federal Estimates, 1990-91). By 1995-1996 the situation had not changed much - $228 million for federal SAR with National Defence getting $115 million for air services and $100 million to Coastguard (National Search and Rescue - Part III of the Federal Estimates, 1995-96).

The expenditures on marine search and rescue occur because Canada has a long and isolated coastline and there are thousands of incidents every year. Regrettably, Coastguard attempts to monitor the type and frequency of incidents are imperiled by incomplete data sets, and frequent changes to the way variables are coded. A major problem is the fact statistics are primarily gathered to show how CG resources are used. Prevention is only a secondary consideration.

No one person has consistently nurtured the data base and in recent years, two other developments have created doubts about the dependability of and meanings ascribed to Coastguard data. Coastguard personnel have been very preoccupied with the trauma of restructuring and, in this climate, statistics are not a priority. A second, perhaps more devastating development, was an inept performance by Coastguard consultants. In the Pacific consultations the statistics showed an overwhelming desire to retain staffed lighthouses but managers went ahead with destaffing. Later, an Ontario desire to compel recreational boaters to license their boats and take mandatory training courses (IER Consultants, 1996; Canadian Coastguard, 1996; 1996a) resulted in another round of national consultations and the production of exceedingly dubious statistics, definitely not worth the money paid to consultants who produced them. Both exercises damaged the reputation of Coastguard and reinforced profound sceptism concerning the utility of "statistics."

Fortunately, the marine incidents database is more reliable and the data more valid than the "consultation statistics." Yet, in the present climate, all Coastguard statistics must be approached with caution. With that as a caveat it appears that each year the Coastguard responds to about 7000 incidents (7200 incidents in 1990; 7176 incidents in 1991; 6558 in-

cidents in 1992, 6185 incidents in 1993 and 6384 in 1994). Table 1 shows the number and length of commercial fishing vessels that the Canadian Coastguard said they assisted in 1990 to 1994 (Coastguard Annual Reports, 1990-1994). The slight decline in the numbers assisted in recent years has more to do with the collapse of fisheries and cutbacks in Coastguard than with the success of any prevention program. Indeed, the most alarming aspect of these data is the fact that, despite the dramatic loss of opportunities to go fishing, each year more than 1500 fishing vessels still come to grief.

TABLE 1

Number and Length of Fishing Vessels Assisted By Coastguard Over a Four Year Period

Size:	1990	1991	1992	1993	1994
Large - over 15 reg. ton	751	872	816	818	793
Less than 15 ton (less than 12.1 metres long)	454	383	356	78	127
Less than 15 ton (8-12 metres long)	571	512	450	505	547
Less than 15 ton (less than 8 metres long)	159	135	173	78	53
Total	1993	1902	1795	1479	1520

In addition to the roughly 7000 incidents (groundings, broken down, person overboard etc) that come to official attention each year, many more occur out of sight of authorities or in places not serviced by the Coastguard. Many are rectified with help from friends, vessels of opportunity, commercial towboats or salvors. Nobody knows how many inci-

dents occur in an average year and there are no dependable mechanisms to monitor the success or failure of prevention programs.

Federal Responsibilities

The Canadian Coastguard and Transportation Safety Board (TSB), both federal agencies, and the Workers Compensation Board of B.C., a provincial agency, are all interested in why fishboats come to grief and involved in various programs designed to make fishing a safer occupation.

The Transportation Safety Board is mandated to advance transportation safety and conducts investigations designed to eliminate deficiencies that give rise to marine accidents and "occurrences." For the TSB, "marine accidents" are of two types - shipping accidents which include collisions, groundings and strikings and accidents aboard ship which include persons being caught or struck by cargo or machinery, falling overboard or on the deck. Marine incidents (noted in reports prior to 1989 as "dangerous occurrences") include near collisions, near groundings, problems associated with shifting cargo and the failure of machinery. In each of the years between 1985 and 1989 there were, on average 1325 "accidents" and 174 "incidents" (TSB Statistical Summary, 1990, p. 3).

For years fishing vessels have been most prominent among those that come to grief in Canadian waters. The TSB investigates some, but not all, marine occurrences and accidents. Table 2 shows the large number of fishing vessels involved in accidents sufficiently serious to merit the attention of the TSB. In recent years the number has declined slightly because of the crisis in the fisheries. These days many fishboats are more likely to be tied to a dock than out fishing. Yet, in 1995 387 fishing vessel accidents came to the attention of the TSB, 444 in 1994, 379 in 1993 and 467 in 1992. Approximately half of all marine accidents investigated by the TSB involve fishing vessels. Considering the number of tugs, ferries and other kinds of vessels plying Canadian waters, the consistent presence of fishing vessels in casualty statistics is noteworthy.

TABLE 2

Vessels Involved in Shipping Accidents Investigated by the Transportation Safety Board

Vessel Type	1991	1992	1993	1994	1995
Cargo	74	69	49	53	36
Bulk Carrier/OBO	120	135	132	137	118
Tanker	32	27	25	26	14
Tug	68	48	43	57	52
Barge	97	41	32	41	47
Ferry	35	22	27	27	26
Passenger	21	20	17	15	20
Fishing	478	467	379	444	387
Service vessels	51	50	30	45	34
Non-commercial	38	26	32	24	30
Other	13	11	12	13	03

Source: *Marine Safety Reflexions*, 10, April, 1996. Publication of the Transportation Safety Board, Ottawa

According to the TSB (Communique 02/95) the following lives and fishing vessels have been lost since 1985. In 1985 142 vessels were a total loss and 37 fishers died; in 1986 120 vessels were lost and 23 fishers died; in 1987 99 vessels were lost and 51 died; in 1988 88 vessels were lost and 36 died; in 1989 98 vessels were lost and 34 died; in 1990 138 vessels were lost and 36 died; in 1991 99 vessels were lost and 21 died; in 1992 89 vessels were lost and eight fishers died; in 1993 78 vessels were lost and 26 fishers died; in 1994 72 vessels were lost and 32 died.

In this list the unusually high number of fatalities in 1987 was due to the loss of four vessels and their crews (n=20) in fall and winter storms on both coasts. One of these, the *Scotia Cape*, is at the centre of an analysis presented later in this paper. In 1989 there was another increase in fatalities due to the loss of three vessels and their crews (n=47) during east coast storms in December.

After January 1, 1996 the TSB utilized five classes of occurrence where Class 1 involves a public inquiry and Class 5 involves data collection for possible analysis. TSB investigations are almost entirely nested within techno-rational discourses and there is little regard for issues arising from race, ethnicity, culture, gender or power relations. In May, 1990 the Board created a "human performance" division to overcome this problem and, these days, there are staff with credentials in ergonomics, psychology and other relevant fields. Their influence can be seen in recent reports although the main focus is technical issues and there is a reluctance to get into the way human foibles or structural conditions evoke accidents. There is an even more marked reluctance to attempt a postmodern analyses of discourses or power/knowledge constellations that imperil mariners.

TSB reports are exceedingly interesting and we depend on them a great deal. However, ways have to be found to get their materials to a broader spectrum of user groups. There is a high level of congeniality and helpfulness in the Canadian TSB yet, in some ways, their situation parallels that in the U.S. where the equivalent agency carries on "ineffectually about excessive speed, failure to use safety equipment, and endlessly cites violations of rules and regulations so complex that even lawyers ... can't figure them out" (Perrow, 1984, p. 170-171). Their popular publications - such as *Safety Reflexions* - are very readable and ways have to be found for broadening the impact of this kind of material.

Provincial Responsibilities

In B.C. the Workers Compensation Board has entered exceedingly uncharted waters and mounting educational programs designed to make fishing a safer occupation (WCB, 1993, 1994, 1995). In 1993, a fairly typical year, the WCB handled 324 claims from injured B.C. fishers and dealt with consequences that flowed from seven deaths (five drownings, one killed by an explosion, one poisoned by carbon monoxide while repairing his vessel (Commercial Fishing Update, 1994).

The WCB will find it difficult to secure the cooperation of fishers who feel beleaguered by declining fish stocks and increases in government surveillance and regulation (Gray, 1986). With regard to the WCB, Young (1994), master of the fishing vessel *Full Tilt I* wondered about the "likely impact of yet another bunch of bureaucrats breathing down one's neck... . We are getting pretty much over regulated in our industry as it is. By the time you have the surveyor from Mutual to look at your boat, the inspector from DFO to peer at your hatches and the guy from the Coast Guard to check your life preservers, the last thing you need is another visit from the WCB. All these people have to be paid from dwindling fish prices" (1994, p. 11).

There is no doubt that for Workers' Compensation Board prevention programs to succeed, they will have to reach beyond the "objective" techno-rational preoccupation with machinery and equipment and engage with the difficult world of power relations on boats, gender, race and the othering of certain ethnically-defined fishers.

Prevention Education

Although less than two percent of federal SAR expenditures are devoted to prevention, an evaluation of Search and Rescue in Canada (Report, 1982) coupled with the Report of the Ocean Ranger (drilling rig) disaster, along with demands for reductions in public spending, have led to an acceleration of interest in the prevention of marine incidents. Prevention is normally construed as regulation (and enforcement of existing standards) and education.

In Western Canada, prevention education is mostly couched as "information transmittal" and, in recent years, encumbered by staff cutbacks in the Coastguard, an air of desperation in parts of the fishing fleets and the presence of fishing families whose approach to safety is not always amenable to traditional educational methods, techniques and devices (brochures, leaflets etc).

Prevention education anchored in a "schooling" model is not congruent with the needs or preferences of significant sectors of the fishing community and rarely informed by principles of adult education. More importantly, there is no evidence to suggest it reaches more than a small percentage of fishers or is based on any sustained study of the industry. At best it is based on vague notions of "creating awareness" or "giving information."

Barriers

There is nothing technically difficult about action designed to reduce fishing vessel accidents. One reason why they are not a high priority is the fact even people trained to use analytical and rational modes of thought believe they somehow defy systematic study and are due to "chance," "bad luck" or "the bloody weather." Another possible explanation stems from the large number of self-styled experts and fatalists ("you can't do anything") in the fishing industry. There is also a prevalence of fundamentalist thought and action. For example, many fishers are prone to vilify or have a generalized hostility for "the government" and racist discourses run through fishers activist organisations.

It is also difficult to secure the cooperation of fishers who already feel beleaguered by declining fish stocks and government regulation. Many successful disease control measures did not require active cooperation and caused little inconvenience for those who benefited. For example, pasteurized milk tastes about the same as non-pasteurized milk, municipal water supplies with fluoride cannot be distinguished from those without. However, when prevention encroaches on what some regard as their "freedom" or when individuals are deprived of their right to engage in culturally sanctioned behaviour (such as drinking), problems occur. Fishers are mostly men who have been conditioned to take risks. Western-style cultures have rewarded the risk taker - whether bull fighter, mountaineer, prize fighter, investor, politician or test pilot - even when risk-taking leads to failure or injury. The fishing industry is crowded with stories about highliners (those who consistently get big catches) who defied all odds to bring a record catch aboard. Prevention measures might call for incorporation of features which prevent incidents (or save

lives) but diminish the status of the user. For example, do "real" men need liferafts or EPIRBS ?

These kinds of cultural and sub-cultural factors hinder the acceptance or implementation of safety messages. Psycho-social barriers to prevention require extensive research, but must be considered together with the fact that prevention measures sometimes involve threats to industries. Thus, when construing the notion of prevention, educators or regulators have to consider questions like -- Who benefits ? Who is in charge here ? Who controls this "knowledge" and whose interests are being served ?

Research

Despite the importance of commercial fishing there is a marked lack of research in Canada that could inform prevention programs for fishers. Even more worrying is that, in times of declining budgets, those who control the most important data could be considered to be in a conflict of interest because their ability to secure resources depends on maintaining a high number of incidents.

Inadequate research easily leads to the adoption of prevention strategies whose adequacy remains untested. There is no shortage of "common-sense" in the SAR community. Yet a lot of programs adopted because of common sense (e.g. handing out pamphlets) fail to withstand critical scrutiny.

For example, "commonsense" suggests that accidents could be dramatically reduced if authorities would impose boat and operator licensing and mandatory continuing education (Canadian Coastguard, 1996, 1996a; Boshier, 1996). But has motor vehicle and driver licensing had a significant impact on motor vehicle incidents (accidents) and why do licensed boat operators still run into the rocks (e.g. Exxon Valdez)? By 1996 it was apparent that the Coastguard "initiative" to impose mandatory training on recreational boat owners was proceeding without any serious regard for the extensive literature on this

subject (e.g. Basic Choices, 1986; Long and Boshier, 1976; Moore, 1976; Rockhill, 1981) and negative outcomes that flow from forcing people to attend classes.

The problem is that, despite the allure of "commonsense" solutions, they sometimes take resources from other more valuable programs. For example, prevention education for fishing fleets is hampered by a lack of theory and data concerning fishing companies and their organizational culture, fishers, their sub-cultures, family life, beliefs and behaviour on and off the boat. Observers might argue that "commonsense" programs or prevention education not supported by research "can't do any harm." But it can lead to inappropriate emphasis (such as on licensing) and dissipate energy and resources. Inadequately researched prevention measures give the impression that "everything that can be done is being done," when, in fact, very little is happening.

Research Traditions

The meagre research on fishing vessel safety is almost all nested within functionalist and techno-rational discourses (e.g. Committee on Fishing Vessel Safety, 1991). The corollary of this type of research is prevention wherein (usually a government) authority prints and distributes pamphlets about, for example, flares, radios, PFD's. There's is a technical (and thus manageable) construction of what fishing families know is a difficult, dynamic world of complex interactions between human, technical and environmental variables (Boshier, 1990, 1991, 1992). Considering the number of people involved, and the economic and cultural importance of fishing, there is only a meagre corpus of literature pertaining to accidents. Nevertheless, several traditions are discernible.

Focus on Death: Clinical psychology is sometimes criticized for focusing on unhealthy people or pathology and, in this context, a good case can be made for studying fishers with a good safety record. However, in the meagre research on fishing safety there has been a discernible focus on incidents involving death - amongst Icelandic seamen (Rafnsson and Gunnarsdottir, 1992), fishermen in Alaska (Gleason, 1983; Schnitzer and

Bender, 1992) New Zealand (Norrish and Cryer, 1990), Nova Scotia (Neutel, 1989), the United Kingdom (Reilly, 1985), British Columbia (Boshier, 1994) and the Canadian Atlantic Provinces (Haselback and Neutel, 1990).

Trends: The Transportation Safety Board and the Canadian Coastguard both publish annual reports wherein the current number of accidents, incidents or occurrences are contrasted with those in previous years. However, in the Coastguard marine incidents database the criteria for inclusion (as an incident) varies from year to year, attempts to claim that accidents are going down (and this is "due to our prevention program ....") are spurious and exceedingly misleading. The TSB makes strenuous efforts to recode old data so it conforms to present coding categories. This is not the case with Coastguard data. Great caution must be attached to speculating about trends and it would be better if certain parties could be separated from their computers and would stop issuing spiffy graphs or bar charts purporting to show trends. Sometimes, fluctuations have nothing whatsoever to do with prevention. For example, the failure of the cod fishery has ensured there are significantly fewer incidents involving Newfoundland fishers and, on the west coast, the Mifflin plan will lead to a more professional fishery and thus fewer incidents.

Fishing Culture: A third kind of approach concerns the sociology or culture of fishing, and represented by a study of core values among Newfoundland fishermen (Whittaker, 1988), a study of fishermen's wives (Dixon et. al., 1984) and Binkley's (1991) conversations with Newfoundland fishermen and Maiolo's (1990) sociology of commercial fisheries.

Psycho-Social Constructions: A fourth tradition concerns superstitions or rituals of avoidance that endanger fishers. Supernatural "explanations" for what goes right or wrong provide fishers with good reasons to avoid safety messages or prevention programs (e.g. Poggie and Gersuny, 1972; Poggie, Pollnac and Gersuny, 1976; Poggie and Pollnac, 1988; Pollnac and Poggie, 1989; Pollnac, Poggie and Van Dusen, 1995). If God, Allah, Buddha

or the lucky charm attached to the windlass is in charge of events why read this Coast-guard pamphlet on EPIRBS or flares?

Iglauer's (1988) *Fishing With John* is a charming British Columbia story of a man's love for fishing and a woman's love for a man. But, at one point, their happy story is punctuated by a burst of rage from John (the fisherman) who has "caught" his girlfriend opening a can of beans with the label upside down. "God," he exclaims. "Now we're done for. No fish and bad luck". Others, such as the owner of the grounded tug *Naskeena-7*[2], attributed their bad luck to leaving port on a Friday. On the salvage tug *Franklin*, described in one of Farley Mowat's (1980) gripping accounts of hurricane winds and bleak nights in the Atlantic, the crew were convinced that bad luck "comes in threes." Many Vietnamese-Canadian gillnetters on the westcoast have a small vase of flowers or some other token to the gods strapped to the windlass or tied down in the wheelhouse.

For many fishing families, fatalities are an inevitable corollary of life at sea. Those who make it into retirement are lucky. Fatalism and superstition provide little incentive for prevention; death, injury and property loss are widely regarded as the price to be paid for fishing. These things "just happen" because "when your number's up, your number's up."

Delivering "Facts"

Education for prevention often involves dispensing "facts." However, it is overly naive to think that once people have the "facts" (about personal flotation devices, flares, liferafts and suchlike) they will change their behaviour in the desired direction. As Festinger (1957) and others demonstrated years ago, people easily reject or rationalize facts if it suits their purposes. Educational facts (e.g. wear a lifejacket) may seem reasonable and stunningly obvious to the educator. But the way they are construed by the recipient, and the extent to which he or she has the power to act on them, will greatly shape the extent to which they

[2] Gulflow Salvage and Marine Safety Ltd salvaged this tug from rocks near the Chrome Island light station. The owner had run aground on a dark Friday night. The vessel was removed in the eye of a bad storm. "I knew I shouldn't have left port on a Friday ... " said the owner.

are integrated into the learner's frame of reference. It is also naïve to think that the presence of sophisticated equipment (such as navigation aids) necessarily enhances safety. If the fisher is a risk-taker the new GPS enables him or her to cut the corners even finer than before (Geller, 1996).

Need For Theory

With limited openings, fishers sometimes have to travel at night or confront adverse weather conditions. They must be practical people with a good knowledge of electrical and plumbing systems, hydraulics and a host of other matters. One wrong slip and a person can be overboard or hauled over a net drum or into a winch. This is a "practical" and life-threatening world and it is no surprise that fishers are not preoccupied with "theory." It sounds "airy fairy" and detached from the so-called "real world." It doesn't pay the bills. It sounds like it might be another complication in what is already a difficult job. But there is nothing as practical as a good theory. Practice not informed by theory soon becomes random and ineffective and, thus far, there have been few attempts to theorise about fishing vessel accidents or their prevention.

Instead of dwelling on weather and equipment, a broadened theoretical approach would embrace human dimensions (and the way fishers "read" their world) as well as structures that shape the fisheries, fishing families and the rhythms of fishing operations. Our purpose here is to insinuate structural and human dimensions into discussions typically nested in techno-rational (functionalist) discourses. Our task is to view fishing accidents, and their prevention, from the vantage point of different or alternative theoretical perspectives. A theory is " ... a provisional explanatory proposition, or set of propositions, concerning some natural phenomena and consisting of symbolic representations of i. The observed relationships among independent and dependent events ii. The mechanisms of structures presumed to underlie such relationships, or iii. Inferred relationships and underlying mechanisms intended to account for observed data in the absence of any direct empirical manifestation of the relationships" (Marx, 1970, p. 6).

A THEORETICAL MODEL

The model presented below was first used to explain the sociology of organizations (Burrell and Morgan, 1979) but has since been used to explain a broad array of other phenomena. It embraces four paradigms that offer different ways of explaining and thus thinking about the prevention of fishing vessel accidents. It rests on a couple of crucial assumptions. One, concerning ontology, is that the way people perceive or construe things is as important as the "objective" world within which they live. The second assumption concerns the importance of power relations (e.g. between skippers and crews, fishers and buyers, men and women on fishing vessels). Some prevention efforts, such as those wherein it is suggested that men listen more closely to women, challenge extant power relationships.

This model is comprised of four paradigms each of which provides a different way of explaining (and thus preventing) fishing vessel accidents. The model contains four quadrants bounded by two axes - one concerning ontology, the other concerning power relations. Part of the power of the model is the fact it is pluralistic and embraces a broad spectrum of thinking about accidents and their prevention.

The Axes

The two axes in Fig. 1 lie in an orthogonal (right-angled) relationship to each other. Treat them like latitude and longitude on a nautical chart.

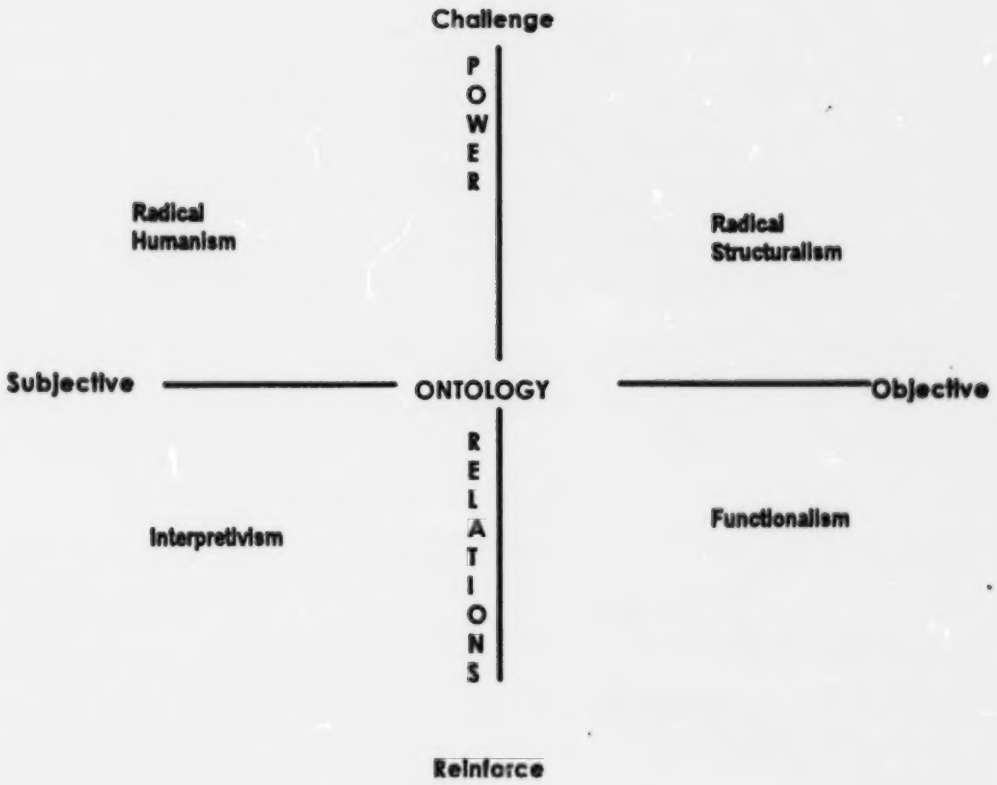

Fig. 1. Theoretical Ways of Constructing Fishing Vessel Accidents and their Prevention

The horizontal axis concerns ontology - the essence of phenomena. Accident investigators and prevention educators vary with respect to the extent to which they think there is an objective "reality" - out there - external to the individual. For some, there is an objective world inhabited by lawfully interrelated variables. For others, reality is essentially a subjective phenomenon that exists within consciousness. It exists "in the mind." Associated with ontology are other assumptions related to preferences concerning epistemology (anti or post-positivist; positivist), one's beliefs about the nature of human nature (free will; determined) or preferences concerning research methodology (qualitative; quantitative).

The vertical axis concerns power and self-interest which are important determinants of prevention processes. Power relationships lay at the centre of fishing vessel accidents and their prevention. Fishing is not a neutral "technical" or benign process. It involves all kinds of struggles - between companies and crews, government and industry, captain and deckhands, male fishers and their wives, fishers and buyers, gear types, ethnic groups and so on. Some of the most vigourous struggles are between gear types and, regrettably, ethnic groups. Somebody's interests are always being served when prevention education programs are mounted. Sometimes these interests are clouded by rhetoric about the public good or concealed within the day-to-day or night-to-night operations of institutions. On fishing vessels the skipper or owner has immense power . Deckhands, wives and others have little power and often suffer because of the asymmetrical way in which power works on a fishing vessel.

Functionalist and Interpretivist oriented explanations for accidents and associated prevention strategies tend to pose no threat to extant power relations. In contrast, Radical Humanist or Radical Structuralist approaches (the upper quadrants) are "conflict" theories that seek to explain deep-seated structural change of a type that invariably threatens the interests of certain individuals and groups. Functionalists also seek change but it is ephemeral and superficial compared to that sought by theorists informed by a conflict perspective.

Burrell and Morgan (1979) spoke of a sociology of regulation and a sociology of radical change to distinguish between theorists who explain society in terms that emphasize an underlying unity and cohesiveness (equilibrium perspective) from those whose explanation for change resides in deep-seated structural conflict, modes of domination and structural contradiction. Those preoccupied with regulation focus on how societies maintain themselves as an entity, how they hold together rather than fall apart. Those concerned with radical change focus on material and psychic deprivation, are often visionary and utopian and concerned with possibilities rather than acceptance of "what is." In this respect our model differs from Burrell and Morgan (1979). Whereas their vertical axis distinguished a

sociology of "regulation" from a sociology of "change" ours is concerned with reinforcing or challenging extant power relationships.

FOUR PARADIGMS

The model contains four paradigms that, if adopted, would require different kinds of emphases in the analysis of data secured during casualty investigations and associated prevention education programs.

Functionalism

Returning to Fig. 1, functionalism provides an essentially "rational" explanation for accident events. It is the dominant ideology of our time and characterized by a concern for social order, consensus and social integration. Its epistemology tends to be positivist. Functionalists want practical solutions to practical problems and are usually committed to social engineering as a basis for change with an emphasis on gradualism, order, and the maintenance of equilibrium. Functionalists attempt to apply models derived from natural sciences to human behaviour. They assume there is an "objective" world "out there" that consists of observable, lawfully-related empirical entities. Mechanistic and biological analogies are appealing and, in radical functionalist states - such as Singapore - it is engineers who control adult education.

Almost all literature on fishboat accidents is written from a functionalist perspective. Accidents are caused by free surface effect, downflooding, a fire in the engine room. The investigator typically focuses on the "objective" circumstances that immediately preceded the fire, capsize or grounding. Data explaining the fire or capsize are quantitatively derived and displayed in graphs, charts or tables. Equations or logarithms are used to explain dynamic events - such as the capsize that resulted when the already listing vessel was hit by a wave. Human errors, socio-cultural factors or structural factors (e.g. the highly competi-

tive nature of the fishery) and the way they shape the behaviour of the skipper or crew, are in the background but rarely brought forward for analysis.

Interpretivism

Theorists located within an interpretive paradigm are "subjectivists" in that "reality" is what it is construed to be. Great effort is devoted to adopting the frame of reference of the participant. Social "reality" is a network of assumptions and "shared meanings." The subjectivist ontological assumptions shared by interpretivists stem from the notion that human affairs are ordered, cohesive and integrated. Interpretivists are more concerned with understanding subjectively construed meanings of the world "as it is" than with any utopian view of how it might be. While they are at the subjectivist end of the ontological dimension, they do not anticipate any threat to extant power relationships.

From an interpretivist perspective it would be important for accident investigators and prevention educators to focus on the way men and women from different cultures and circumstances "read" situations that arise around fishing vessels. For example, an immigrant from a poorer tropical country will construe "safety" differently than someone brought up in a cold northern climate. When men get into trouble they often protect their ego by declining to call for assistance whereas women are not so constrained.

Many B.C. fishers hail from Nordic, Balkan or Asian countries. Most boaters have heard the excruciating discussions that occur on Channel 16 when fishermen whose first language is something other than English attempt to secure assistance. Coastguard radio operators do not appear to speak languages other than English. Quite apart from implications that racist ideology has for SAR-response these factors also create a formidable challenge for prevention. It does not suffice to simply translate safety pamphlets into languages other than English. According to the TSB (1993a) "language proficiency" was a major contributor to the capsize and loss of the *Flying Fisher* and it's two crew members. On

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this occasion the TSB spoke very forcefully about the plight of the approximately 1000 Vietnamese-Canadian fishers on the west coast and cited communication difficulties as "frequent contributing factors" (TSB, 1993a, p. 11). Language is an issue but there is also a need for casualty investigators and prevention educators to have regard to culturally-constructed conceptions of safety and different understandings and norms concerning what to do when in distress. It is not just a matter of language.[3]

An example of research nested in the interpretivist paradigm is Thorlindsson's (1994) analysis of the "skipper effect." For this Icelandic fisherman/researcher, success at fishing largely depends upon the skipper who "reads" situations correctly and engages in reflective practice.

Radical Humanism

The radical humanist paradigm encompasses theorists who want to upset extant power relationships but are anchored within a subjectivist ontology. Those in this paradigm are usually anti (or "post") positivist. But, unlike interpretivists, radical humanists want to overthrow or transcend existing social arrangements. Many radical humanists employ concepts developed by the young Marx to describe how people carry ideological superstructures which limit cognition and create a "false consciousness" which inhibits fulfillment. Radical humanists want to release people from constraints - which largely reside in their own cognitions. They seek transformation, emancipation, and a critical analysis of modes of domination. They want people to reconstruct their view of reality and take appropriate action. Thus praxis becomes reflection (or reconstruing) followed by action.

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[3] During gillnet openings in B.C. up to a 1000 Vietnamese-Canadians are on their boats fishing. Inevitably there are incidents. Nets get tangled in propellors, vessels take on water hit the rocks or capsize. When these citizens attempt to get assistance the fact there are no Vietnamese speaking Coastguard radio operators creates difficulties and slows response times of SAR units. Vietnamese-Canadians tend to answer "yes" to any authoratative sounding question, particularly if asked by a government official. This causes confusion. Coastguard, like other organizations, still constructs itself around a fiction which is that "Canadian" means English or French. In B.C. this duality makes no sense and coast guard might considering hiring a Vietnamese speaking person to bunk down in Coastguard radio stations during gillnet openings.

Radical Structuralism

Radical structuralists share fundamental assumptions that buttress functionalism but are committed to the overthrow of social structures that build "false consciousness." If radical humanists focus on consciousness and meaning, radical structuralists focus on structures, modes of domination, deprivation, contradictions within an objective social world. Within this paradigm are those who focus on deep-seated internal contradictions within society while others focus on power relationships. But common to all theories in this paradigm is the notion that each collectivity (e.g. fishing company) is characterized by inherent conflicts and, within these, lie the basis of change.

To what extent do incidents stem from adverse socioeconomic circumstances? The lack of safety equipment -- VHF radios, flares, liferafts, personal flotation devices (PFD's) -- also stems from poverty or a lack of access to reasonable supplies. Education construed from within a radical structuralist perspective would show how incidents arise from objective socioeconomic circumstances.

WHAT HAPPENED TO *SCOTIA CAPE?*

Many different "isms" are nested within the four broad paradigms just described. Now our purpose is to bring these somewhat abstract concepts back to the water level. To illustrate how the model might broaden understanding of fishing vessel accidents (and thus better inform prevention programs) here is a case study involving the *Scotia Cape*, where seven people lost their lives and a large B.C. fishing vessel disappeared without trace.

On January 27, 1987, at 2300 hours, the 189 ton, 36 metre combination seiner/trawler *Scotia Cape* left the B.C. Packers wnarf at Steveston, bound for fishing grounds in the Queen Charlotte Islands. There were seven experienced fishers (one of whom was a woman) on board a vessel that had a reputation for big production and excellent wages. Although very bad weather was forecast, nobody left behind had heard discussion about

the possibility of altering the fishing plans (TSB, 1987). Gales were blowing in the Queen Charlotte Islands from January 27, later upgraded to storm warnings from January 29 to February 5. Although the skipper had previously capsized on the sister ship to *Scotia Cape*, he apparently decided to press on into the storm. After leaving Steveston, the vessel was last sighted in Goletas Channel, near the tip of Vancouver Island, but its exact destination was not known because the master usually kept it a secret.

It was only when *Scotia Cape* failed to contact B.C. Packers, at a pre-arranged time that the Rescue Coordination Centre (RCC) was alerted and a search mounted. The first report of a possible mishap came from the brother of the *Scotia Cape's* skipper (RCC, 1987). After talking with Kelvin Mark, SAR controllers decided that the vessel could "have been anywhere on the coast between the west coast of the Queen Charlotte Islands and Vancouver" (RCC, 1987, p. 3). After alerting other mariners through general marine broadcasts, search authorities tasked a Buffalo aircraft from 442 squadron in Comox and an Aurora from 407 squadron. Coastguard cutters and lifeboats were sent out to search shorelines. But because the exact location was not known and no EPIRB (Emergency Position Indicator Radio Beacon) was deployed, this presented difficulties, as did storm force winds.

The skipper of *Scotia Cape* was an employee of B.C. Packers a large and well established B.C. fishing conglomerate. B.C. Packers, the vessel owner, had not placed either an EPIRB or an auto alarm (which broadcasts a distinctive tone on Channel 16, the international calling and distress channel) on *Scotia Cape*. Later they would spend large sums of money by chartering aircraft to join the search (RCC, 1987). Eventually, RCC decided that the most likely location for *Scotia* Cape was in Queen Charlotte sound. Search controllers secured drift data from the Institute of Ocean Sciences and the U.S. Coastguard "Assisted Search Planning" system and determined that Queen Charlotte sound, Hecate strait, and north to the Alaskan shores were the highest probability search areas. By day three of the search two Buffalo aircraft, two Labrador helicopters, two Hercules aircraft (one US Coastguard, one Canadian Forces), two Trackers, one Aurora and a chartered

helicopter were flying over the search area. Below them two Coastguard cutters and a Department of Fisheries patrol vessel laboured through rough seas. During day four of the search a hand logger in the area told authorities he had heard a distress call from *Scotia Cape* on January 31st at 1845 hours. He said the voice sounded agitated. By day six the government aircraft had been joined by a B.C. Packers aircraft and two others (a Goose and a Beaver) chartered by the company. On the same day the skipper's son revealed that his father intended to fish for yellow tailed cod ("Greenies") and hoped to catch 200,000 pound of this species. Greenies are caught in the daytime and, according to the son, the remaining 150,000 pound for a full load would ideally be perch or sole, fished at night, probably about 30 nautical miles north of Triangle Island. On the same day a B.C. Packers aircraft was investigating a position supplied by a psychic.

The search for *Scotia Cape* involved two fixed-wing aircraft from Comox, single aircraft from Edmonton, Prince Rupert, and Sandspit; helicopters from Kodiak and Sitka (Alaska) and Sandspit, B.C.; four Canadian Coastguard cutters and , a Canadian Fisheries vessel. In all, there were 20 aircraft aloft at various times, and six government vessels on the water for a total search time of 700 hours. The search covered 105,800 square miles with negative results. For eight days authorities and local people risked their own lives and equipment searching for the vessel but found nothing.

There are various ways of calculating search costs and the formula used here is based on a 1995 estimate from Rescue Coordination Centre. Assuming $500 per hour for a boat and $4000 an hour for an aircraft, at 700 hours, this search cost the Canadian government more than $2 million. To this must be added the costs of private vessels (other fishboats etc) that participated in the search, the Workers' Compensation Board (WCB) payout to the deceased's family members, as well as all the secondary costs that would take years to emerge.

There was no debris, no oil slick and no survivors. Hence the Transportation Safety Board investigation, which yielded a report of 70 pages was based on weather reports, previous

inspections of the *Scotia Cape*, earlier incidents involving its sister ships and only meagre information concerning the master and his proclivities. As well as the TSB (1987) report, the Rescue Coordination Centre prepared a report on the search (RCC, 1987). The vessel insurers faced a payout of about $1.2 million.

The master, who had survived a capsize and sinking on the *Scotia Bay* on September 6, 1979, was not so fortunate this time. There were numerous other trawlers in the Queen Charlotte's during the time in question but most were at anchor in sheltered waters during the worst of the storm. On January 30th Environment Canada reported storm force winds (60-80 knots) at Solander after which the wind sensor failed. The TSB thus concluded that, although other fishing vessels were also at sea, it was imprudent for *Scotia Cape* to leave sheltered waters in the face of a storm.

The master was dead, along with the 45 year old mate, the 44 year old engineer, three deckhands aged 32, 43 and 28, all men, and a 33 year old female cook. Like other similar tragedies of this kind, this one traumatized several families. Now there were seven more names for the deceased fisher's memorial at Steveston.

The search costs can be calculated, the value of the lost vessel is known, and the efforts of the TSB investigation could be gauged. But apart from funerals and matters of immediate importance there are social costs - for spouses and children at home, which continue over many years - that cannot be quantified. It is also necessary to remember the exposure to danger suffered by the searchers obliged to work during a storm.

We estimate that the *Scotia Cape* incident cost at least six million dollars. Of this, two million dollars was in the form of a "survivors benefit" paid by the B.C. Workers' Compensation Board.

From one perspective the fact public authorities will spend large amounts of money in an effort to save people is a testament to the value placed on human life in Canada. From

another perspective, note that a single incident in B.C. cost much much more than entire national prevention budget for one year. Prior to destaffing the salary bill for the 35 lighthouses in B.C. was $2.4 million. Hence, B.C. light stations could all be restaffed for approximately three years for the price of the *Scotia Cape* incident.

A THEORETICAL PERSPECTIVE

The model's implications for prevention are now illustrated by positing alternative explanations for the loss of *Scotia Cape*. Each explanation suggests the need for a different focus in prevention programs. Because this large vessel disappeared without trace, and there were no survivors to interview, we largely depend on the TSB investigation but go beyond their analysis and posit explanations from other than a functionalist perspective. At the centre of the present analysis is the notion that "free surface effect" or a capsize were not the cause, but the result of the accident. The causes (or causes) of this accident were in place and having their effect long before the vessel left Steveston.

The task here is to explain the disappearance of *Scotia Cape* from within varied theoretical perspectives. None of these explanations, including the functionalist TSB analysis, represent the ultimate truth of why *Scotia Cape* disappeared. There are multiple truths and each has different implications for prevention. Each is simply an angle, a theoretically different way of viewing the problem. Our task is to raise issues not usually considered in marine casualty investigations and rarely show up in prevention campaigns. In this way we hope to broaden the discourses pertaining to prevention.

Functionalist Perspective

The disappearance of *Scotia Cape* is easily explained from a functionalist perspective and we need look no further than the TSB investigation. First of all, the vessel carried no EPIRB and thus, from the outset, searchers were at a disadvantage. The system for de-

ploying the liferaft was not adequate and, even if the seven crew got into it, the chances of being picked up were jeopardized by the fact nobody had their position.

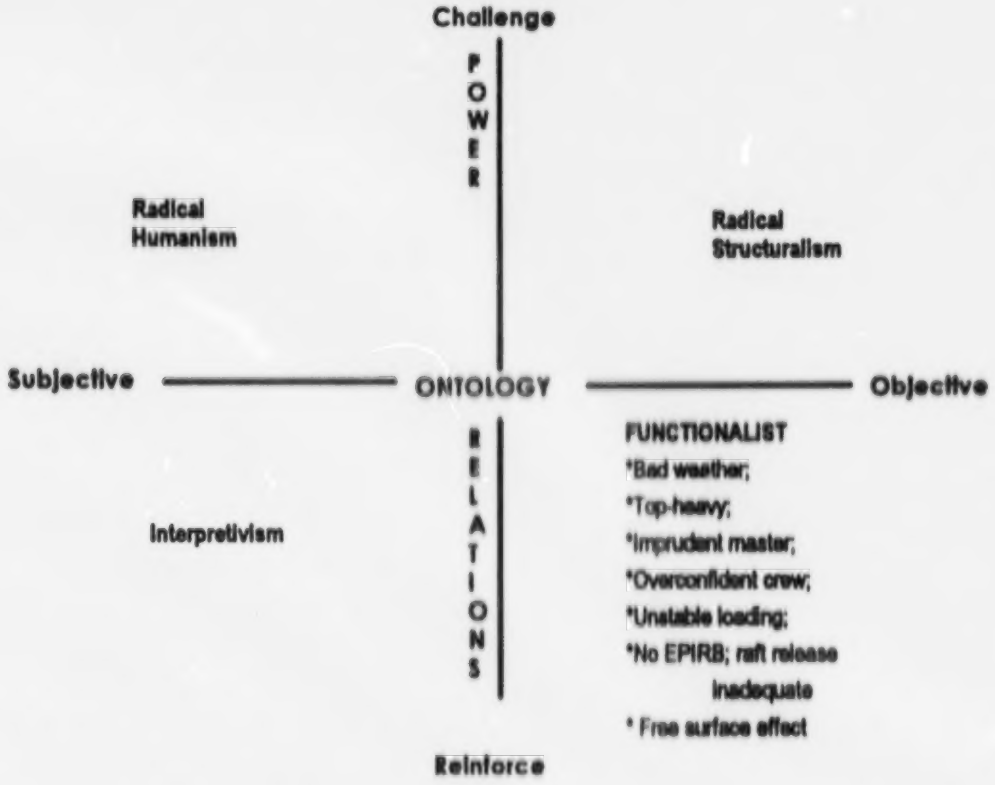

Fig. 2. Functionalist Explanation For the Loss of Scotia Cape

The *Scotia Cape* was a stern trawler with a net that would be towed at a depth of 200 fathoms at a speed of approximately three knots along a precise contour, irrespective of the direction of the wind and sea. *Scotia Cape* was known as a wet ship. At times the crew worked on deck in waist deep seawater. The Transportation Safety Board (1987) claimed that "the crew who sailed on the vessel had supreme faith in the vessel's ability to continue fishing in adverse weather and this was a factor in the crew's high earning capacity" (p. 21). But they also highlighted how the "free surface effect" (liquids in partially filled tanks) could overwhelm it.

The RCC (1987) report details conversations with family members and fishers on similar boats who claimed that the vessel was most vulnerable while dragging or retrieving nets. If the net got caught on a snag or difficulties developed while retrieving it, this combined with even a moderate sea state, could have an adverse effect on stability and cause the vessel to roll over and sink. In rough seas everything on the deck would be securely tied down so little flotsam would get loose from the sinking vessel. Hence the lack of debris.

On September 6, 1979 the *Scotia Bay,* sister ship to the missing vessel had capsized and sank while attempting to bring a large load of fish aboard. But, on that occasion, there was no loss of life. With the earlier incident in mind, it was easy to conclude that *Scotia Cape* went to the bottom in similar circumstances.

Interpretivist Perspective

Storm-force 70 knot winds were forecast. Contrary to popular wisdom, these days weather forecasting is a fairly exact science and, as predicted, the storm arrived. The skipper had previously experienced a capsize in the sister ship of *Scotia Cape* and was now heading into an area famous for rough seas and rogue waves. Unlike other skippers seeking shelter, did the skipper of *Scotia Cape* interpret this as an opportunity to get some uninterrupted fishing on grounds that had previously produced good money for him and the crew?

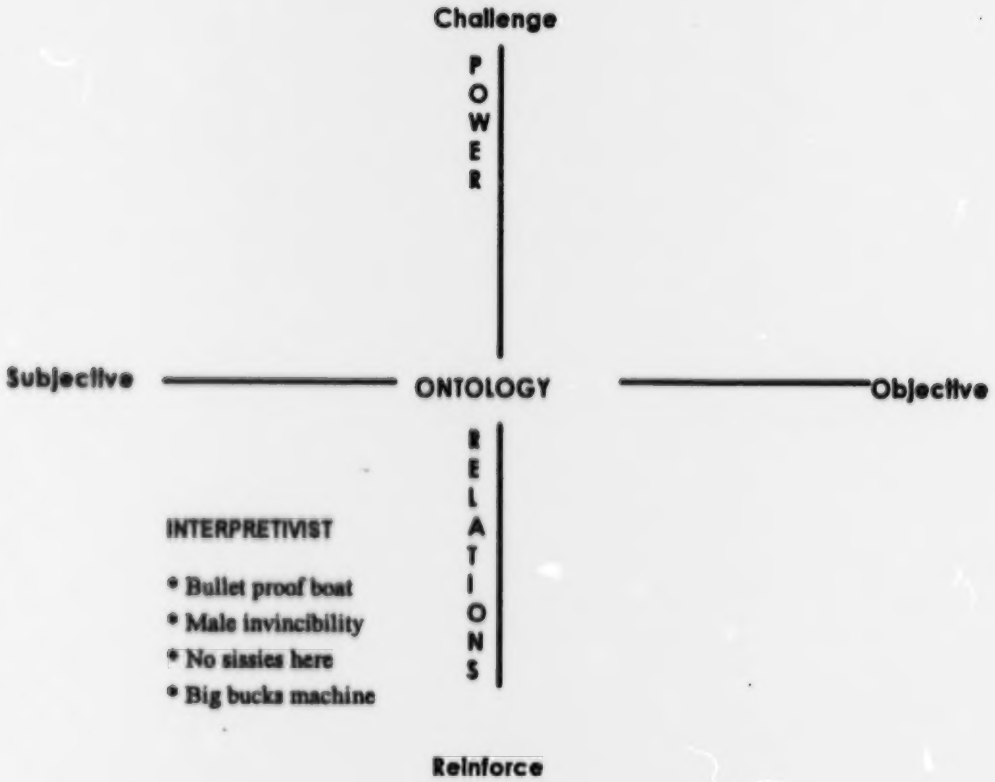

Fig. 3. Interpretivist Explanation For the Loss of Scotia Cape

Although he would have preferred calmer seas and didn't enjoy working in waist high water crashing across the deck, previous trips had demonstrated that *Scotia Cape* could take some punishment. Fishers can't be choosy about crew, weather or much else and he had long ago accepted that you "take it as it comes." Others were on the radio whining about weather but, for him, every day spent in shelter was a day wasted.

What meaning did crew members ascribe their predicament? This was supposedly a bullet proof ship and they'd been here before. On the other hand *Scotia Bay* had rolled over. But, on that occasion everyone, including their skipper, had a lucky escape. Was it just a matter of being on side with "lady luck?" As waves swept across the deck and the vessel

rolled ominously did anyone come to doubt the wisdom of what they were doing? If so, what was said, yelled or screamed above the roar of waves and wind? How many of the crew were gripped with panic and immobilized by fear? If the net got snagged to one side and the vessel heeled would they have the mental resources needed to cut it free?

Radical Humanist

Nothing was said as the crew piled aboard in Steveston and heard the storm warning for the Queen Charlotte's but, as *Scotia Cape* got near the tip of Vancouver Island, the radio chatter suggested other vessels had already run for shelter. Some on those on board felt apprehensive about what they were doing, but once having stepped aboard in Steveston, had no way to get off.

The master had over 25 years experience fishing in B.C. and, according to the TSB (1987) "had an excellent reputation as a fisherman and master and, although stated to be a cautious person who had considerable respect for the sea, was acknowledged to often fish the vessel in adverse weather" (1987, p. 34). In the pecking order, the master of *Scotia Cape* had a considerable reputation even though his proclivity for staying out in storms was a source of concern. But, most other male heroic figures - Ed Hillary on Everest, Scott of the Antarctic, Peter Blake of round-the-world sailing fame - also endured adversity. Even in the best of times, fishing is not the height of luxury or comfort. There were good reasons for continuing to crash through the seas. Besides "if you don't like the heat, get out of the kitchen ..."

Was this an "individual error" or was the master nested in a male discourse that routinely exposed people to extreme danger? To what extent were crew members in a position to exercise any choice? To what extent was the decision to continue fishing made by the

master or the mate? What did the deckhands and cook think about this and did they have any power? What discourses or dismissive strategies were used to discount apprehensions on the ship? To what extent were the interactions that preceded a capsize nested in sexualized ("you've got no balls ... you want to fuck us out of payday?"), homophobic ("if you girls don't want to be here, swim ashore ... ") or similar discourses?

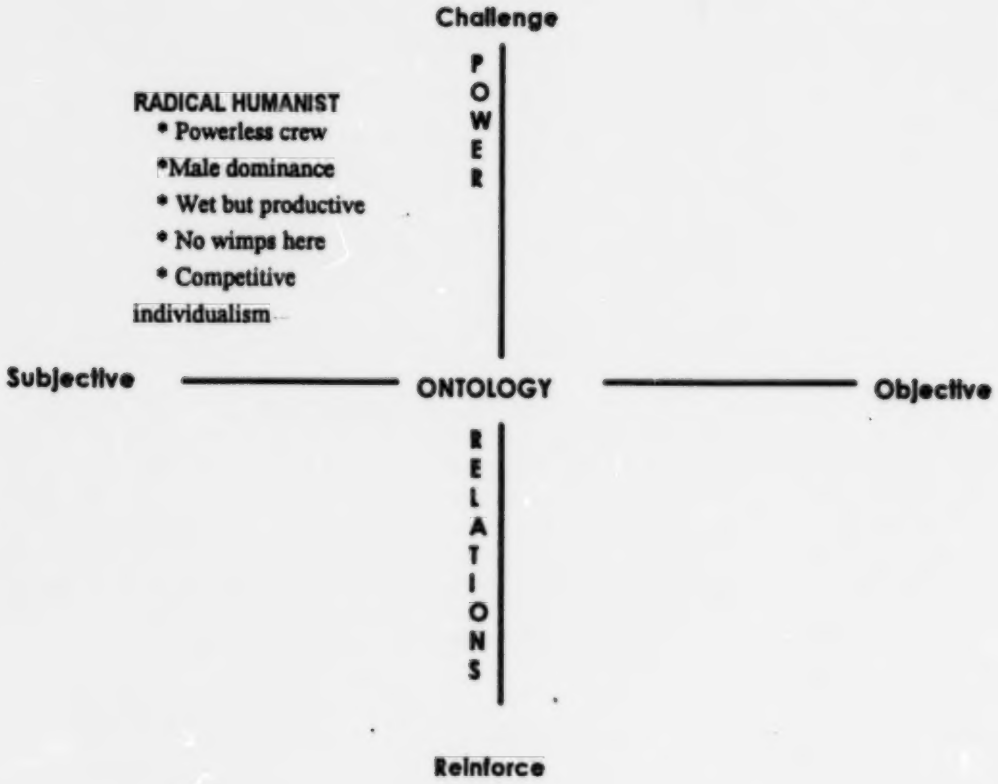

Fig. 4. Radical Humanist Explanation For the Loss of Scotia Cape

Were the men on board concerned that running for shelter would have earned them the label sissy or wimp? Were they prepared to overlook the precariousness of their situation because of the payday that might lie ahead? If so, why did they need that money, how were these needs created and, to what extent was their presence in this storm part of a generally toxic or unhealthy lifestyle? In other words, were their deaths simply an extension of a generally unhealthy mode of living or was this an aberration, an unfortunate conjunction of bad weather and a problem with, for example, the winching gear or lack of stability on the ship?

What was the role of the only woman aboard, who occupied the often difficult and ambiguous role of cook? In the gendered and overwhelmingly male dominated culture of a large fishing vessel like this one did she have any power at all? It would be almost impossible to prepare food in the mayhem of 80 knot winds and towering seas. Was she dismissed as a wimp? Maybe a bit of a nuisance among the "men." Or had she long ago become "one of the boys."

The crew almost certainly deferred to the will of the skipper; the cost of opposing his decision to "press on regardless" would be too high even though the consequences of the storm were terrifying. Besides, the atrocious weather would eventually abate and those who had fished through the storm would be laughing, their superior insight intact, their reputation for big production further enhanced, their pay packets swollen. The "girls" that had sought shelter in nearby coves or harbours would hear about it. In the highly masculinized culture of a large fishing vessel the others would be accused of having "lost their balls."

Radical Structuralist

Like working-class people everywhere fishers enact their lives within a web of class relations. In this case the most salient concerned the relationship between the owner and the crew. The second set concerned "false consciousness" - fictional notions of social mobility that impelled the crew search for big wages.

Company/Crew Relations

B.C. Packers is a large corporation incorporated in 1928 but with roots that go back to 1902. Their famous "Cloverleaf" trademark was acquired in 1908. Today B.C. Packers is the largest processor of seafood in British Columbia and many canneries built last century are owned by this large conglomerate.

Scotia Cape was valued at more than $1 million yet this corporation had somewhere neglected to purchase and install an EPIRB or an auto alarm . An EPIRB is a battery operated transmitter that, when activated, transmits a unique identifier that enables search authorities to identify the name but, more importantly, the position of the vessel in distress. Older 121.5 MHz FPIRB's have a "location accuracy" of 20 km; newer 406 MHz EPIRBS's have a location accurancy of 3 km. EPIRB'S are the 911 call of vessels in distress. A vessel as large as *Scotia Cape* would normally have a Class 1 EPIRB that floats free and is activated automatically. The EPIRB signal is detected by satellites which, in turn alert rescue authorities. An auto alarm is a device incorporated into the ship's radio. In the event of distress it transmits a distinctive oscillating tone that alerts nearby vessels to the fact a distress broadcast will follow.

When *Scotia Cape* was lost in 1987 both items were available at a modest cost. What aspects of the organizational culture at B.C. Packers created a situation where large company vessels were sent into storms without this equipment and, if this was the pattern, what norms and expectations surrounded the maintenance of winches, blocks, nets and the rest of the machinery on company vessels? How could this corporation justify the contradiction of sending ill equipped vessels to sea while, at the same time, flying a company aircraft?

There are fishers from many different nations and cultures working in B.C. Declining fish stocks and prices are tempting them to take risks and, these days, fishers are not likely to

challenge companies that send poorly equipped vessels to sea. There are ways of neutralizing "trouble-makers" and "shit-disturbers." The pressure on fish stocks is also causing fishermen to go into rougher waters than previously at precisely the same time as Coastguard is abandoning certain aids to navigation, destaffing light stations and closing lifeboat stations.

Prevention educators should be careful not to habitually blame the victim for incidents. The cause of an incident often resides in structural factors and conditions of work that leave the fisher with limited options and an inability to exercise choice. In this case a company that couldn't muster the energy or find the money to install an EPIRB and auto alarm on *Scotia Cape* later provided their company plane and thousands of dollars for aircraft charters to assist the search. From a Marxian or Radical Structuralist perspective the skipper and crew died because of predatory capitalism and the historic tendency of corporate elites, snug in warm offices and safe on shore, to abuse workers at sea. From this perspective the accident arose from unequal and exploitative class relations. The capsize, the fluids slopping in the tanks (the "free surface effect") were a result, not a cause of the accident. From a Radical Structuralist prospective, the cause resides in the exploitative indignities of capitalism and predatory instincts of corporate elites in the B.C. fishing industry.

False Consciousness

For a radical structuralist, false consciousness also sent *Scotia Cape* into danger. The master and crew had long ago adopted fictional notions of upward social mobility to rationalize the fact they pushed boat, crew and equipment over the edge or "outside the envelope" not once, but time and time again. Since childhood, the crew of *Scotia Cape*, like most others, have been conditioned to believe that advancement depends upon individual

initiative and effort, that upward mobility, a house in the suburbs, a cottage in the islands, is available to those who go after it. Rewards depend upon individual initiative.

They have needs - to pay mortgages, educate children, acquire vehicles and acquire their own boat. These aspirations, regarded as "normal" by most others like them, are uncritically accepted. The company owners - those who profit from the crew work - enjoy relatively privileged lives in the better parts of Vancouver. But they earned this right through their earlier efforts. With the right kind of commitment and tenacity, and a few lucky breaks, the crew of *Scotia Cape* could make a handsome living. Or so they thought. Risk is an accepted part of the business. After all, "no profit, no gain". Or, as every fisher knows, "snooze and you lose".

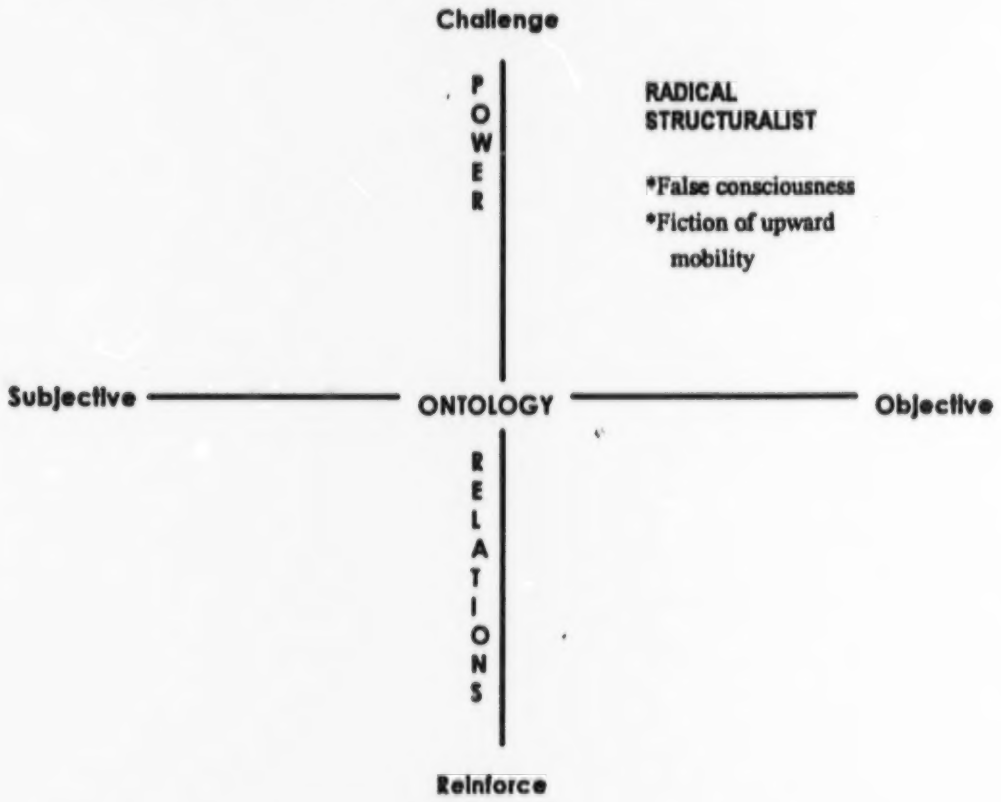

Fig. 5. Radical Structuralist Explanation For the Loss of Scotia Cape

For a Radical Structuralist the notion that rewards are inevitably given to those who pursue them is a dangerous delusion, comparable to the bizarre idea than any American can become President. It backgrounds the importance of structural relations, particularly those between companies and workers. Because of "false consciousness" or delusions about rewards for individual initiative, and the tendency to overlook or adapt to predatory behaviour by employers, fishers press harder, go further, stay out longer and rationalize excessive risk-taking and danger.

Company owners shuffle papers and make smart deals from warm offices with carpet on the floor, or from the cell phones in their cars. In contrast, the seven crew on *Scotia Cape* had hurled their bodies and the company ship against a maelstrom. Were these just motivated but deluded workers who glared at mountainous seas and thrashed around in waist deep water at nightime in the dead of winter? It was almost impossible to eat, let alone sleep, aboard the heaving vessel. Was it all for the big payday?

The six men and one woman who signed on in Steveston found themselves trapped in a tapestry of unequal power relations that goes back to a time when kings built navies and put an iron-willed captain in charge. The master acted on behalf of the company. He didn't need explicit instructions because he knew what was expected and required. If the master intended to defy the weather forecast and the other six wanted to seek shelter, the structure of power on a fishing vessel does not invite, let alone permit, a challenge to the judgment of the master. Anyone questioning the quality of the equipment, the absence of an EPIRB, the missing auto alarm, would soon be labeled a "trouble-maker" and sent "down the road." In the middle of storm would any of the men want to "wimp out" just because a big blow was underway. The opinions of the sole woman aboard would not count because she was a "girl."

Reflection

After a two million dollar effort, federal search authorities had no words of reassurance for the *Scotia Cape* families. Indeed, in the RCC (1987) report on the search, whereas the officers at B.C. Packers are fully named, the crew's families were reduced to an acronym (NOK - 'next-of-kin"). After the search, reports were filed and the TSB investigation completed, discussion inevitably shifted to prevention and what could have to be done to ensure there was no reoccurrence of this or similar tragedies.

So, in the end, the question is - given the various circumstances and availability of different theories, how can education be used to prevent fishing vessel accidents? One answer is that education should be used in many ways, some that focus on the vessel and its equipment, others that focus on the operator and crew and yet others that embrace the socio-cultural and socio-political context in which fishing occurs. But, in the end, it comes back to ontology and power relations.

PREVENTION EDUCATION

By now it should be apparent that the prevention of fishing vessel accidents depends in significant ways on education that has adequate regard for power relations and ontology. A more thorough approach to prevention education would involve an exploration of issues that arise out of Interpretivist, Radical Humanist, Radical Structuralist as well as the more familiar Functionalist ways of construing accidents and their prevention. With this in mind, our remaining task is to raise issues pertaining to the content of and processes used to deploy prevention education programs for fishers.

An observer whose view of marine incidents is interpretivist will place great emphasis on the way fishers construe safety, risk, their masculinity, the weather and other attributes of life on the water. The emphasis here would be on a subjective view of the world. For example, how do men and women construe safety, risk and prevention? There is a strong suspicion in some quarters that a macho attitude results in situations where people are aware of dangers but fail to adopt the appropriate behavior -- just like cigarette smokers or people who drive without seat belts. An approach informed by a subjective perspective would be particularly important for new-Canadians who fear authority, have learned to distrust government, and do not understand prevention messages in English.

Educators should focus on the way people construe the world differently, and develop educational concepts and processes tailored to the multiple realities inhabited by fishers. Prevention education construed on this basis would be participatory, conducted in community -- rather than institutional -- settings, involve teachers and learners of equal or similar status and designed to empower (even poor) fishers to take action to protect themselves. It would also lay stress on power relationships and the extent to which gender dominance creates vulnerabilities in person overboard or other perilous situations. It would problematize and challenge "macho" behaviour, the male proclivity to take risks or try be a "hero."

In contrast, an observer who believes there is an objective reality, and that variables are lawfully interrelated, is likely to be less interested in subjective constructions of the world than with technical details of weather, machinery, aids to navigation and boat handling (Boshier, 1990; 1991). These are exceedingly important, as are the maintenance of proper navigation and other aids that help fishers deal with currents, rock piles, fog banks, winds and other environmental hazards. But they are relatively easy matters to deal with compared to the complicated interactions of subjective human factors involving perception, learning, motivation and socio-culturally acquired ways of construing safety. Flares and personal flotation devices are significantly less complicated than human foibles.

From Training To Education

Prevention education programs informed by Interpretivist, Radical Humanist, Radical Structuralist as well as Functionalist perspectives would involve education rather than training. "Training" denotes a fixed content and the notion there is a consensus concerning "correct" procedures. The focus is on course content (e.g. collision regulations) which is usually contained in ring-binders and trotted out year after year. An educational approach that has regard for the socio-cultural backgrounds of the learners and, places power relationships in the foreground would involve use of participatory techniques, large amounts of group work, and the skillful use of case studies (e.g. *Scotia Cape*). The metanarratives (e.g. collision regulations) would not be abandoned. Rather, they'd be incorporated into more participatory formats that respect learners and value their experience. "Instructors" in marine "training" institutes would have to relinquish some power, give up the urge to constantly "teach" and find ways of eliciting and legitimizing cognitive constructs that learners bring to the educational setting.

The broadened content and participatory processes would go hand in hand. It would not be possible to have one without the other. Language and terminology would be important. Instead of training we'd have education. Instead of curriculum we'd have programs.

Program Content

Programs nested in the three alternative perspectives would involve examination of issues arising from the socio-cultural backgrounds and cognitive perspective of learners. Power relations, the sociology of the fisheries, would be in the foreground. Gender politics and "macho-male" behaviour would be in the foreground. Instructor's would give up the idea

there is only "one way" to secure safety. Instead, there would be adequate regard to the highly differentiated nature of the fishery and the fact a modest two-man crabbing operation cannot be compared to a 14-man offshore dragger.

In the language of postmodernism, instructors would abandon metanarratives in favour of a more fluid and differentiated approaches shaped to meet the needs of learners from different ethnic groups, gear types and positions of power and powerlessness. Prevention programs based on a functionalist (i.e. techno-rational) analysis of fishing vessel accidents usually involve "dispensing information" or "facts" about piloting, fishing practices or equipment. They also tend to be Eurocentric and place white, English-speaking persons at the centre. Asian-language speaking persons are the "other" who get hectored about learning English and doing things the "Canadian" way (as if there's some Canadian "essence").

Ideally, much program content will be drawn from the experience of ethnically-defined fishers in different gear types. More programs should be offered by or in conjunction with vessel owners, unions, ethnic fishing associations, community groups and other interests. In B.C., fishers wanting to study at marine training facilities associated with Institutes of Technology and similar entities, face a curriculum designed by experts, many of whom have never set foot on a fishing vessel. Learners have to "take it or leave it" and, significantly, few ethnically defined fishers report for such "training." Most don't "take it" and many that start soon "leave it." The power relations in these institutes are profoundly unequal and, in some courses, such as on marine emergency duties, questions are discouraged and the instructor brooks no challenge to the "correctness" of his lecture. Learners are constructed as children. Their experience is irrelevant.

Fishing vessel accidents would be more likely prevented if educators adopted an ideology of adult education (instead of training). Education programs nested in the theoretical perspectives described here would contain heavy leavenings of psychology, anthropology, sociology and other social sciences. Investigators and educators would stretch far beyond ergonomics or "human factors," let alone collision regulations and emergency duties. Alternative approaches would involve discussion of gender, ethnicity and the different norms and understandings held by trollers, seiners, gillnetters, crabbers and so on. There would be a concerted study of socio-political factors (structural relations) that shape fishing operations and this safety.

Program Processes

In the recommended prevention education programs there would be fewer lectures - where the instructor lays out his or her perspective - and more group work, discussion, role plays, and simulations where learners bring forward their experience and perspectives. The fisher's stories - about near misses and big hits - would be shared and analyzed in systematic and theoretically focused ways.

Instructor's would make more lavish use of case studies but, instead of just "telling" learners about incidents, employ participatory techniques that unmask different ways of interpreting findings found in casualty investigation reports. If TSB investigators can imbue their reports with a socio-psychological and socio-cultural perspective they will be even more useful for training purposes than at present. The case study, long a technique favoured by adult educators, is very potent with fishers because, in many instances, the learners knew the deceased whose names appear in the report and most are familiar with the circumstances (e.g. rough weather, the pressure of competition, taking a short cut)

that immediately preceded the accident being studied. When using case studies the instructor should ensure that learners interrogate the case from different theoretical perspectives. They should not uncritically accept the explanation proffered by the investigator because this will often refer to a result, or end point (e.g. free surface effect) but not the "cause" (e.g. company negligence) of the accident. The focus should be on causal chains that, in many cases, began long before the vessel left the dock.

Where there is doubt about why a vessel became a casualty informed speculation, based on interviews with persons that knew the deceased and their habits, coupled with study of similar fishers and organizational culture, leads to informative and educationally suggestive conjecture. For example, it is reasonable to assume that free surface effect was a factor in the loss of the *Scotia Cape* but it would also be desirable to question the habits, motives and discourses that explain why the skipper continued seaward in the face of atrocious weather. The educator would also need to ask why the company hadn't bothered to install an EPIRB or auto alarm on the vessel and to question other structural relations involving B.C. Packers. In too many cases educators and casualty investigators ignore the context (often characterized by very exploitative power relations) within which fishing occurs, focus on the individual and end up "blaming the victim." Prevention education based on the alternative paradigms would be participatory, involve use of local (and thus familiar) materials, place power-relations and the socio-economic, political and other contexts in which fishing occurs, at the centre (not in the background) of deliberations.

SUMMARY AND CONCLUSIONS

Fishing vessel accidents occur because of complex interactions of human, technical and environmental factors. They usually occur because of the actions, thoughts or behaviour of

human beings. Human behaviour occurs admidst a tapestry of unequal and sometimes exploitative power relations. Despite the fact humans are at the centre of fishing vessel accidents accident investigators and prevention educators are preoccupied with "technical" matters and equipment. There's is a functionalist perspective anchored in an objectivist ontology. Equipment, machinery, weather and other "objective facts" are important. But these preoccupations must be broadened and now is the time for accident investigators and prevention educators to ground their strategies in Interpretivist, Radical Humanist and Radical Structuralist as well as Functionalist approaches.

We described each approach and then used different perspectives to analyse what happened during the lost of *Scotia Cape*. According to the TSB investigation, *Scotia Cape* probably rolled over and sank because of "free surface effect." As a result of this and similar investigations there is a considerable emphasis on stability at marine institutes and other places. "Free surface effect" is important but it was a result, not a cause of the accident that beset *Scotia Cape*. The cause of the accident resides in the unequal power relations between the company and the crew, the skipper and the crew, in their "false consciousness" and in their subjectively derived notions of "safety" and "risk". These things are rarely brought forward in prevention education programs and, in our view, should be in the foreground and not overwhelmed by collision regulations, righting arm curves, marine electronics, piloting and marine emergency duties (MEDS).

Prevention education programs informed by Interpretivist, Radical Humanist, Radical Structuralist as well as Functionalist perspectives would involve use of techniques that elicit and make use of the learner's background and experience. Because the fishing fleet is highly differentiated, content would be adapted to local particularities. Prevention education processes would be participatory, involve fewer lectures and more active collaboration with learners.

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